# Assessment and Validation of Cone Beam Computed Tomography in the Localization and Volume Estimation of Foreign Bodies in the Maxillary Sinus

**Thesis**

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بسم الله الرحمن الرحيم

﴿وَعَلَّمَكَ مَا لَمْ تَكُن تَعْلَمُ وَكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيماً﴾

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# Contents

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# List of Figures

# List of Tables

# INTRODUCTION

# Introduction

Formation of the paranasal sinuses occurs late in fetal life, each of the paranasal cavities (maxillary, ethmoid, frontal, and sphenoid sinuses) is enclosed by its corresponding craniofacial bone **(Zarbo et al, 2011**). The maxillary sinus is the largest of the paranasal sinuses and is situated in the body of the maxilla. Its anterior wall is the facial surface of this bone, and its posterior wall is the infratemporal surface. The roof of the maxillary sinus is the floor of the orbit and its medial wall is the lateral wall of the nasal cavity (**Baily et al, 2006)**.

The bone of the maxillary sinus floor can be very thin, and in some individuals, the roots of the premolars and posterior teeth project through the sinus floor, into the sinus **(Abe et al, 1992**).

**Liston, 2002**, stated that great care must be taken during dental treatment not to accidentally introduce foreign bodies into the antrum. **Bassam, 2010,** added that the increased pneumatization of the maxillary sinus and decreased alveolar bone thickness can often be observed after extraction of premolars and molars, which would complicate placement of implants.

Foreign bodies found in the maxillary sinus include tooth roots, burs, dental impression material, root-filling materials, dental implants, and needles **(Laskin and Dierks, 1999)**.

In most cases, these materials gain entry via oroantral communication. In some less-common cases, materials gain access to the sinuses via a tooth socket, via the pulp chamber of a tooth, or during an operation near the antrum **(Dimitrakopoulos and Papadaki, 2008)**.

According to **Tanasiewicz et al, 2013**, prompt surgical intervention to remove a foreign body from the maxillary sinus is recommended to prevent possible sequelae of acute or chronic sinusitis or mucosal cyst formation.

**Saunders et al, 2000**, stated that plain radiographs play an important role in the management of dentomaxillofacial lesions especially for detection, treatment, and follow up of bone lesions. Furthermore, **Ikeda, et al 1998,** and **Fernandez, 2000**, added that the evaluation of maxillary sinus can be performed using plain radiographs (lateral and frontal) and Computed tomography scans. Lateral and frontal head films offer limited information about the maxillary sinus, with the inherent errors of a two dimensional representation of a three dimensional structure.

Cone bone computed tomography (CBCT) represents the latest generation in medical imaging and has become a well-accepted tool for oral and maxillofacial diagnosis and treatment planning. This is mainly due to its advantages over conventional computed tomography, which include lower effective radiation dose, lower costs, easy access and shorter acquisition times. (**Marti, 2007** and **Guijarro-Martínez and Swennen, 2011)**.

**Rafferty et al, 2005**, concluded that CBCT imaging yields high quality images of skeletal anatomy, soft tissues and air-filled spaces, while exposing the patients to lower levels of radiation. Therefore, CBCT is a highly useful method in examining the maxillary sinuses and aiding in endoscopic surgery of the sinuses.

In order to avoid disadvantages such as superposition of anatomic structures, horizontal and vertical magnification and a lack of cross-sectional information that are associated with panoramic radiographs, the present study will be conducted using CBCT images to localize and estimate the volume of foreign bodies in the maxillary sinus.